Abstract Submitted
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An ^{27}Al^{+} quantum-logic clock with systematic uncertainty below 10^{-18} SAMUEL BREWER, JWO-SY CHEN, AARON HANKIN, ETHAN CLEMENTS, NIST, Boulder and University of Colorado, Boulder, CHIN-WEN CHOU, NIST, Boulder, DAVID WINELAND, NIST, Boulder and University of Colorado, Boulder and University of Oregon, DAVID HUME, NIST, Boulder, DAVID LEIBRANDT, NIST, Boulder and University of Colorado, Boulder — We describe an optical atomic clock based on quantum-logic spectroscopy of the $^1S_0 \leftrightarrow {}^3P_0$ transition in ^{27}Al^{+} with a systematic uncertainty of 9.0×10^{-19} and a frequency stability of $1.2 \times 10^{-15}/\sqrt{\tau}$. A ^{25}Mg^{+} ion is simultaneously trapped with the ^{27}Al^{+} ion and used for sympathetic cooling and state readout during clock operation. Improvements in a new trap have led to reduced secular motion heating, compared to previous ^{27}Al^{+} clocks, enabling clock operation with ion motion near the three-dimensional ground state. Operating the clock with a lower trap drive frequency has reduced excess micromotion, compared to previous ^{27}Al^{+} clocks, leading to a reduced time-dilation shift uncertainty. Other systematic uncertainties including those due to blackbody radiation and the second-order Zeeman effect have also been reduced. [1]

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